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A. C. TRUE, Director.

NORMAL SCHOOL INSTRUCTION IN AGRICULTURE.

BY

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Office of Experiment Stations,
Washington, D. C., September 22, 1909.

Sir: I have the honor to transmit herewith a manuscript on Normal School Instruction in Agriculture, by M. J. Abbey, professor of biology in the State Normal School, Mayville, N. Dak. The manuscript was prepared under the direction of D. J. Crosby, of this Office, and deals with the purposes and methods of teaching agriculture as this subject has been developed at the Mayville State Normal School during the past four years by Professor Abbey in connection with his work in other sciences and in cooperation with teachers of mathematics, geography, and other subjects making up the normal-school course.

The problem of preparing young men and young women to teach elementary agriculture in connection with the other branches taught in the primary and secondary public schools is one which now commands widespread and serious consideration, and it is believed that an account of the work Professor Abbey has been doing along this line in North Dakota will be welcomed by all who are concerned in the professional training of teachers.

I therefore recommend the publication of this manuscript as Circular 90 of this Office.

Respectfully,

A. C. True,
Director.

Hon. James Wilson,
Secretary of Agriculture.

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NORMAL SCHOOL INSTRUCTION IN AGRICULTURE.

INTRODUCTION.

The purpose of this circular is to set forth in a brief way the manner in which agriculture is taught at the Mayville State Normal School. This institution is located in the eastern part of North Dakota, in what is known as the Red River Valley. The fertile soil and the extensive scale upon which farming is here conducted marks this region as a typical farming section of the Northwest. The aim of this normal school is to prepare young men and women to teach in the elementary schools of the State. The young people who attend it come from the farms or smaller towns, and when they go out to teach they are called upon to give instruction in what is known as elementary agriculture. To meet this demand, a department of agriculture was established at the normal school four years ago. The course at first extended through one term's work, but has been lengthened until practically two full years are now devoted to agricultural instruction. In this institution, as in most normal schools, such instruction is in the experimental stage, and it has not been easy to adapt it to normal-school conditions and demands. Yet the work has attracted many young people, and the success with which they have subsequently instructed others along these lines indicates that the instruction has been effective. Not all the problems in teaching agriculture have been solved, but it may justly be claimed that a few of the more difficult of them have been solved. In this circular is presented a synopsis of the work, which it is hoped will be useful to others engaged in the professional training of teachers.

WHY THE NORMAL SCHOOL SHOULD TRAIN TEACHERS IN AGRICULTURE.

The particular work of the normal school is to prepare young people to teach school. Whatever else it may do can not be considered normal-school work.

Whenever it fails to give its students instruction in those branches which later they are expected to teach, it is failing to perform the proper function of a normal school. Agriculture is now a recognized part of our common-school course of study and its importance is conceded to the same extent as that of arithmetic or any of the other common branches. A large percentage of the young people who enter this school find it necessary, before they are graduated, to serve an apprenticeship in the country schools. The necessity of having a training in agriculture is at once apparent. Those students who are able to remain in school the entire four years without any interruption are not compelled to serve this apprenticeship in the country schools. After graduation they are employed in the town or city schools, but the class of children they are called upon to teach does not differ to any great extent from that of the rural school. Until the rural schools are brought to a higher degree of efficiency, parents will continue to send their children to the town and city schools, even at a considerable cost for transportation. This large influx from the country makes it necessary to provide courses of instruction along lines which shall be of most service to the country child if he is not to be educated away from country-life efficiency. Even though it be taken for granted that few country children receive instruction in the town and city schools, and that the school officers of such schools do not commonly feel obliged to provide courses which are of particular interest to the country child, it is believed that a reason for instruction in agriculture still exists and that it will be of much service to the city child.

To successfully teach geography, literature, or nature study, the teacher must be somewhat familiar with the principles of agriculture. An understanding of plant and animal life helps one to understand and appreciate the interests of child life. No other study brings one into more intimate touch with all the natural activities of life than does agriculture. City schools are fast recognizing the importance of subjects which are practical and not simply bookish. The tendency in all lines of education is toward the practical. City boys and girls have talents and instincts which lead them as well as the country boy and girl to become interested in rural occupations. Open-air work, in which the muscles and mental faculties may both be exercised, is of more value to the child who has grown up within the restrictions of the city than it is to the country child. For this reason it is believed that in North Dakota the normal school should prepare its students to teach agriculture in the city schools.

The question is frequently asked, Can not this work be done by the agricultural colleges or the universities? The work of those institutions is to ascertain and impart facts and principles. At the present time a number of those institutions have established departments of education and are training teachers along the lines of agriculture and mechanic arts. Special teachers of these subjects will always be in demand. The normal schools, however, must prepare the great mass of teachers who are to teach in the elementary schools. When the universities or agricultural colleges assume to do this work they are encroaching upon the proper field of the normal schools. If the normal schools fail to do this work it must, of course, be done by other agencies.

Experience in teaching, covering several years in graded-school work, in an academy, and in a normal school, leads to the conviction that no subject requires more sound knowledge of the principles of pedagogy than does the subject of agriculture. Results are not immediate; but the child mind likes to see results at once. Hence the child's interest must be maintained until results can be accomplished naturally. A continuity in subject-matter must be worked out, and new devices are always necessary to maintain interest. Who but the person thoroughly trained in pedagogical principles and methods can meet these requirements?

Furthermore, there is something to be said as to the value of such teaching to the normal school itself. The work of a normal school should be practical throughout, and the dominant industry of a State should determine to some extent the nature of the instruction given in its normal schools. In a State like North Dakota, for example, the successful instructor in geography, literature, history, physics, chemistry, geology, botany, or zoology, makes—or should make—frequent reference to the facts and principles of agriculture. His instruction in all these studies will be much more effective if his students are familiar with the subject which he so frequently brings to the aid of his own work. For all these reasons it seems that the normal school is acting entirely within its proper sphere when it gives instruction which serves the purposes here mentioned.

THE PLACE OF AGRICULTURE IN THE NORMAL-SCHOOL CURRICULUM.

The place that agriculture should occupy in a normal-school curriculum depends upon three things: (1) The section of the country in which the school is located; (2) the length of the course of study; and (3) the age and previous preparation of the students. In North Dakota more than 90 per cent of the people are engaged in agricultural pursuits. This accounts for the strong emphasis which is placed on the subject. The course of study extends over four years, following the usual eight grades of the elementary schools.

Since agriculture was introduced into the school the course of study has been changed twice. Each change, however, has tended to place more stress upon this line of work. The course which has been most satisfactory provides for three years of required science instruction. Students who have completed the first year's normal course are admitted in the second year to agricultural botany. Zoology and animal husbandry are taken up in the third year. In the fourth year problems in practical physics are studied. The last change made in the course of study placed physics on the elective list, and under the direction of a different instructor. To meet the demand of special students and high-school graduates a special course in agriculture is offered in the summer school.

The strong feature of the above course is that it secures continuity. It extends over a period of three years with scarcely a break in the general theme. Students who have completed the first year are prepared for the two following years. The first year is devoted to the study of plant life and its relation to the soil and atmosphere. The nature-study work of the grades has given the students a general knowledge of plant life. These facts are built upon in such a way that within a short time the class is studying the plant in its agricultural aspect. The first term of the second year's course in zoology is devoted to a study of animal husbandry. In the two following terms the economic usefulness of animals is always emphasized. The course of study which is being described calls for physics in the senior year, or third year of agricultural instruction. It has been found that this course may be made as practical as any course in the curriculum. A supplementary text, "Physics of Agriculture," is used in connection with the regular text. Experiments with soil, strength of materials, and motor powers add interest and are in line with the work of the two previous years.

PLANNING THE YEAR'S WORK.

It is necessary for the teacher to see the year's work completed before it is commenced. That is, he must know exactly what he expects to do and when he expects to do it. Each phase of the subject has its particular best time when it can be most easily taught. Certain material can be obtained at one season of the year which can not be obtained at another. Subjects can be so arranged that they are either interesting or otherwise. Interest and continuity must be maintained. To do this it is necessary to have material collected so that it can be used at the best time. The students are therefore required each fall to collect, dry, label, and pack away material needed for future use. For example, the study of corn and potatoes commences in the fall, when the class goes to the experimental garden and selects the seed for the following spring. Other cereals that are to be used for class judging must be collected when they are ripe, although the study of them may not come for several months. Now, to collect, label, and properly preserve this material requires careful direction and supervision by the instructor.

Suppose that specimens of durum wheat are to be collected, and that no instruction has been given as to what constitutes a "true-to-type" cereal. The best specimens have but little more significance to the students than the poorer ones. The harvest season of the year will not permit time for a detailed study of the characteristics which are to be expected in a plant that is true to type; so the class is expected to get merely a general idea of what constitutes a true-to-type stem of this particular variety of wheat by consulting certain pages of the text-book where this wheat is described. With these facts in mind the student selects specimens which in his mind come nearest to the description. The stems are cut close to the ground, or carefully pulled up by the roots, care being taken not to remove any of the leaves. Two stems are bound in a bundle, with a card attached giving the name of the collector, date, and variety of wheat. When the specimens are thoroughly dry they are placed in drawers for later examination and study.

Collecting weeds is somewhat more difficult. The large number of weeds found in any one locality makes it necessary to adopt a somewhat different method. Each student is required to make a collection of different weeds found in the locality. This is done during the summer school, and the specimens are used largely by the students during the regular school year. The first collection is made when the weeds are in blossom. They are carefully preserved and mounted upon uniform cardboard 7 by 14 inches in size. The roots, stems, leaves, and flowers are mounted. On one side of the cardboard is given the name of the weed, the date, where found, and the name of the collector. Later in the year a collection of weed seeds is made. The seeds are placed in small vials, labeled, and packed away with the cards.

The instructor follows a carefully worked-out plan prepared as the result of previous experience, but this plan is not disclosed to the students. By means of questions and suggestions the class is able to work out the year's plan for themselves. This method is pursued in order that they may be able afterwards to plan a course adapted to their own schools. The course of study in agriculture as planned by the state department of public instruction must necessarily be an outline—merely suggestive. It will always be necessary for the teacher to work out his own year's course, and his experience in planning a normal course enables the student, later as teacher, to plan a course for his own school.

SYLLABUS OF THE WORK.

TEXT-BOOK INSTRUCTION.

Until recently text-books in agriculture were few. It is not yet an easy matter to obtain one that meets all the requirements of a good text. One that is suitable from the teacher's standpoint is not adapted to the requirements of the pupil. It has been found that a book written by two North Dakota men is the most satisfactory for use in this State, since it deals with local conditions and is authentic.

Two double periods each week are devoted to assignments in the text. These assignments are supplemented by quizzes on the laboratory and experimental work. Points that are not made clear by the text are explained in a set of typewritten additional facts not otherwise mentioned. They make extended explanations in class unnecessary. Care is exercised that each student shall master the facts pertaining to the different subjects. Unlike the facts of arithmetic, they are new for the most part. Unless they are thoroughly mastered by the prospective teacher while he is a student, he will be unable to devote the necessary time to organization and presentation of subject-matter when he later attempts to teach the subject. The laboratory work precedes the work of the text-book. The following is a brief outline of the topics and the order in which they are studied:

CLASS EXERCISES.

Soil.—Function; origin; composition; kinds; texture; humus; temperature; moisture; aeration; tillage; drainage; enrichment; crop rotation; methods of cultivation.

Atmosphere.—Composition; uses; relation to the soil; relation to plant and animal life.

Seeds.—Definition; parts, with description and purpose of each part; selection; testing; germination; depth of planting.

The plant.—Definition; importance; economic classification; parts of a plant and the function of each part; propagation; the influence of ecological factors; frost; diseases and their remedies.

Cereals.—Wheat, oats, rye, corn, rice, barley. History; classification; production; environment, growth; soil best adapted for each; cultivation, as to preparation of soil; planting; harvesting; marketing and selection of seed; diseases and their remedies.

Forage crops.—The grasses and legumes. History; distribution; importance; description; cultivation.

Fiber plants.—Flax, hemp, cotton. History; description; economic importance; cultivation; diseases.

Weeds.—Definition; disadvantages; the common weeds of the locality, with a description of each and method of eradicating.

Unclassified.—Sugar plants; tobacco and coffee. Description; how used; economic importance; cultivation.

Horticulture.—Definition; selecting a garden and orchard site as to soil, convenience, drainage, windbreaks, and general effect. How to plan a garden and orchard; methods of propagation; cultivation; pruning; transplanting; harvesting and storing fruit and vegetables; heredity. How to improve old varieties or introduce new ones; fertilizers; enemies of the orchard and garden. A study of the common fruits, and especially those that are best adapted to the locality.

Rural school grounds and buildings.—The necessity of pleasant surroundings and how to obtain them; the planting of trees, shrubs, vines, and decorative gardens; inside decoration and conveniences.

Farm animals.—The relation of farm animals to agriculture, supplying food for man, fertility to the soil; relation to diversified farming; diseases of farm animals.

Cattle.—Origin and history; classified as beef form, dairy form, and dual-purpose form; the characteristics of each type; the leading beef breeds—Shorthorn, Hereford, Aberdeen Angus, Galloway; the leading dairy breeds—Holstein, Guernsey, and

Jersey; the leading dual-purpose breeds—Shorthorn, Polled Durham, Brown Swiss, and Red Polled. Study each breed as to its origin and history, the strains, general appearance, popularity, beef qualities, milking qualities, and weak points.

Dairying.—A careful study of the dairy type of cow and the care that is necessary to bring the best results. Amount of milk; composition of milk; contamination of dairy products; how to prevent contamination; care of cream for market and for butter making; Babcock test; the cream separator; artificial butter; the profits from different methods of dairying.

Horses.—Origin and history; classification as to type—light-weight horses and draft horses; light-weight horses classified as carriage horses, road horses, and saddle horses; the characteristics of each; the breeds—French Coach, German Coach, Hackney, Cleveland Bay, American Trotter, Thoroughbred, and American Saddle Horse; the breeds of draft horses—Percheron, Clydesdale, Shire, Belgian and Suffolk Punch; the characteristics of each of these breeds.

Sheep.—Origin and history; classification as to types—heavy breeds, down breeds, and mountain breeds, or fine wooled, medium wooled, and coarse wooled; fine wooled—American Merino, Delaine Merino, and Rambouillet; medium wooled—Southdown, Tunis, Dorset, Shropshire, Cheviot, Suffolk Down, Hampshire Down, and Oxford Down; coarse wooled—Leicester, Lincoln, and Cotswold; the origin and history, general appearance, adaptability, meat, and wool of each breed, and comparison with other breeds.

Swine.—Origin and history; characteristics; classification as to types—large, medium, and small, or on the basis of color and bacon-producing qualities: The large breeds—Chester White, Improved Yorkshire, and Tamworth; the medium breeds—Berkshire, Poland China, Victoria, Duroc Jersey, and Cheshire; the small breeds—Suffolk, Essex, and Small Yorkshire.

Poultry.—Importance of poultry raising; care and management of poultry; size and location of poultry house; classification as to types—egg breeds, meat breeds, general-purpose breeds, and fancy breeds; the laying breeds—Leghorns, Minorca, Black Spanish, and Hamburg; the meat breeds—Brahmas, Langshans, and Cochins; the general-purpose breeds—Plymouth Rocks, Wyandotte, Orpington, and Rhode Island Reds; characteristics of these breeds.

Care of stock.—Importance; when to feed; the amount and kind of feed; ventilation; cleanliness and drainage of stock barns; exercise and kind treatment.

Farm management.—Farm plans, including size and location of fields, buildings, fences, and roads; comparison of the different types of farming, as grain, mixed, stock, and dairy farming; care and use of farm machinery; labor; capital; ownership or rental; marketing problems; records and accounts.

School-extension work.—The importance of school children entering into various production contests, such as corn, strawberries, potatoes, beets, etc.; how to organize such contests.

LABORATORY INSTRUCTION.

It has already been mentioned that material must be collected at different times to supply the laboratory. Collecting, labeling, and storing gives the student some idea of the material which he will study later. Now he comes to the real examination. He provides himself with a 6-H pencil, bottle of india ink, drawing pen, drawing paper, and an eraser. A locker, containing a compound microscope, hand lens, and dissecting set, is assigned to each member of the class. Students are seldom permitted to work together. Experience has proved that it is better to place the material upon the tables before the students enter the room. Time is saved and there is not the opportunity to waste which comes when they are permitted to sort out their own specimens. The first few minutes are devoted to a careful examintion of the material to be studied. Next, it is sketched with the 6-H pencil. While this is being done the instructor passes to the various tables and points out any peculiarity which may have escaped the attention of the student. The specimen is next studied according to a prepared outline, which has been printed upon sheets of paper of the same size as the drawing paper. Later these are placed in manila covers, facing each other. All drawings are traced in india ink. Score cards for judging cereals and animals are used in judging contests. The laboratory periods are eighty minutes in length, twice a week. The following is a brief outline of the work done during the past year.

Soils.—Microscopic examination of soils; types of soil and subsoil; productivity of soil and subsoil; effect of drainage on soil temperature; effect of drainage upon growth of plants; capacity of loose soil to retain water; capacity of compact soil to retain water; capacity of humus soil to retain water; percentage of water, air, organic matter, and mineral matter in soils; effect of lime in clay soil; effect of humus in clay soil; effectiveness of a soil mulch; capillary rise of water in soils; weight of different soils; evaporation from the soil; testing for alkalinity; testing for acidity; classification of the soils in the locality.

Seeds.—Studying the external appearance and characteristics of seeds; parts of a seed; germination; effect of temperature upon germination; different depths of planting; effect of too dry soil upon germination; effect of too wet soil upon germination; purity of seeds; plant food stored in a seed; development of the young plantlet from the seed.

Plants.—Showing the effect of light, heat, air, and moisture upon different plants; evaporation from plants; rise of water in plants; food from the air and soil; experiments to illustrate the various methods of plant propagation.

Cereals.—(The following are copies of the cereal descriptive cards which are used in the study of the cereals. Slight modifications make them suitable for the study of any cereal:)

Cereal descriptive cards.

WHEAT.

(1) Variety.
(2) Trueness to type.
(3) Spike.
    (*a*) Bearded or smooth.
    (*b*) Length.
    (*c*) Shape.
    (*d*) Color.
    (*e*) Number of spikelets.
    (*f*) Arrangement of spikelets.
    (*g*) Number of fertile spikelets.
(4) Kernel.
    (*a*) Texture.
    (*b*) Number of damaged kernels.
    (*c*) Weight of 100 kernels.
    (*d*) Germination test.
(5) Stem.
    (*a*) Length.
    (*b*) Number of nodes.
    (*c*) Number of leaves.
(6) Root system.
    (*a*) Kind.
    (*b*) Length.
    (*c*) Length determined by what?

CORN.

(1) Variety.
(2) Trueness to type.
(3) Ear.
    (*a*) Shape.
    (*b*) Length.
    (*c*) Circumference.
    (*d*) Weight.
(4) Rows.
    (*a*) Number of rows.
    (*b*) Space between rows.
    (*c*) Space between kernels.
(5) Butt.
    (*a*) Size as compared with entire ear.
    (*b*) How filled.
(6) Tip.
    (*a*) How filled.
(7) Kernel.
    (*a*) Length.
    (*b*) Shape.
    (*c*) Dented or smooth.
    (*d*) Uniformity.
    (*e*) Number of kernels wanting.
    (*f*) Total weight.
(8) Color.
    (*a*) Grain.
    (*b*) Cob.
(9) Cob.
    (*a*) Circumference.
    (*b*) Rigidity.
    (*c*) Weight.
(10) An estimate of the ear as a whole.

Forage crops.—Learning to recognize the different grasses and legumes by means of the head and seed; studying the plant according to a prepared outline similar to the one for cereals; drawing and labeling emphasized.

Weeds.—Identifying, pressing, and mounting the most common weeds of the community; kind of soil in which they grow best; approximate number of seeds; how dispersed; how the weed is exterminated; collecting seeds in small bottles and labeling; identifying weed seeds in mixtures with grain.

Horticulture.—Drawing a plan for the ornamental planting of a rural school ground; plan for an orchard and garden; making a hotbed; testing seeds; work in the school garden; practical work in grafting, budding, and making cuttings; transplanting; using garden tools; preparing and using Bordeaux mixture and kerosene emulsion; identifying common garden and orchard insects; fungus diseases.

Farm animals.—Near-by farms visited to study the characteristics of the various animals; farm buildings; the use of the Babcock test; testing foods for protein, carbohydrates, and fat; simple chemical tests to determine albumin in milk and the effect of salt upon the juices of meats; making a balanced ration.

Farm management.—Visiting a flour mill, a building in construction, a harvest field, and noting methods employed; laying out a farm as to buildings, walks, and fences; determining the cost of labor, machinery, soil, and transportation.

TYPICAL LABORATORY EXERCISES.

The following are directions for a few of the laboratory exercises that have been performed by the normal classes. Each member of the class does this work and records his results in a special notebook. Exercises are frequently taken from such texts as Bergen's Elements of Botany.

(1) Have each pupil make a collection of the different kinds of soils in the locality of the school. Teach the names, the characteristics, and the composition. Next put like soils together in boxes for work in other exercises.

(2) Fill several bottles with the various kinds of soil. Tie a piece of cloth over the end of each bottle. Bore holes in a piece of board for the neck of each bottle to pass through. Invert the bottles with their necks passing through the holes and extending into tumblers, each containing the same amount of water. Note which takes up the most water and which the least. What do we call this process?

(3) Tie cloths over the tops of several lamp chimneys and fill the chimneys with different kinds of soil. Invert the chimneys in a basin of water and see which soil will take up the most water. Let them stand in the room and see which dries out the most rapidly.

(4) Plant seeds in the different soils and note the growth of the plants. Tabulate results from day to day.

(5) Make a clay ball and let it freeze for two or three nights. Bring it into the schoolroom. What happens? Does this have any bearing on fall plowing? Explain.

(6) Fill two flowerpots with soil taken from the same place, but use the surface soil for one pot and the subsoil, or the soil that is found at a depth of a foot and a half below the surface, for the other pot. Plant in each pot half a dozen kernels of corn. Give each pot the same care. Note results. How can the surface soil be enriched?

(7) Heat thoroughly over the fire a basin full of soil. Be sure that all the vegetable matter is consumed. Place this soil in a tomato can which has holes in the bottom. Fill another can with soil taken from the same place, but not heated. Plant in each can six kernels of the best wheat that can be obtained. Give to each can the same care and condition. What do you conclude is one of the necessary elements of a productive soil?

(8) Fill seven flowerpots with the poorest soil that can be obtained, either sand or clay. In the first two pots mix thoroughly 20 grams of lime plus 2 grams of phosphoric acid. In the third mix some very fine manure. In the fourth mix 5 grams of lime and 2 grams of sodium nitrate. In the sixth use nothing but the soil as gathered, but water the plants with water that has percolated through manure. In the seventh pot let the soil remain as it was collected. Plant three kernels of corn in each of the seven pots and give to each the same care. Tabulate results.

(9) Moisten a piece of bread and rub over it a lemon that has mold upon its surface. (Most decayed lemons are covered with a white material which is called mold.) Cover the bread and place it in a warm room. Stick a pin into a decayed apple and then stick it into a sound apple. Watch for results. In both experiments what takes place? Should decayed fruit or vegetables come in contact with those that are sound?

(10) Take a quart of wheat from different parts of the bin and weigh it. Remove all half kernels, dirt, weed seeds, and other foreign matter. Weigh again and subtract from the original weight. What percentage of this wheat is pure?

Select 100 grains from another quart of wheat. Take these as they run, not choosing the best. Place these between sheets of moistened blotting paper in a room where the temperature is not lower than 80° F. Count the number of kernels that do not germinate. What conclusion do you reach?

(11) Draw a map of the home farm or of some farm near the school building. Indicate the crops that have been grown on each field for the last three or five years. Ascertain the number of bushels grown per acre and on what principles the owner plants a certain crop on one field and a different crop on another field.

(12) Practical questions on corn and wheat. Is the word corn used in the Bible? If so, what is meant? How does corn act in very dry weather, and why? Name all the uses of corn. Is there any part of it that is wasted? Why does the United States lead in the production of corn? What part did corn play in the early settlement of this country? What is the current price of corn per bushel? Can corn be fed at home with more profit than by shipping it? Explain how. How many pupils entered the State corn-growing contest last year? Where is a market found for most of the wheat grown in this State? Is it good practice to raise nothing but wheat upon a farm? Why? Why not? How does the number of bushels per acre grown to-day compare with the number grown ten years ago? Explain. Is it good policy to burn straw? Explain. What is meant by "Minnesota grades?" Which variety of wheat makes the best flour? Explain the process of making bread.

APPARATUS.

The apparatus used in the physical and biological laboratories forms the basis of that used in the agricultural courses. Among the articles most frequently used are the following: Lamp chimneys, beakers, test tubes, glass tubes, glass cutter, alcohol lamps, litmus paper, funnels, thermometers, pulleys, inclined plane, air pump, batteries, cells, battery motor, weights, scales, meter sticks, dissecting sets, dissecting microscope, compound microscope, and germinating boxes. Such chemicals as sulphur, chlorate of potash, zinc, red oxid of mercury, ammonia, sodium, copper sulphate, mercury, potassium hydroxid, and sodium hydroxid are also frequently used in agricultural practicums.

From time to time the following pieces have been added, which may be designated as distinctly agricultural: Babcock tester, a double-wheel hoe, several tanyer hoes, spades, common hoes, rakes, shovels, finger weeders, long-handled trowel, weed spade, small hand roller, dibbles, garden line, small saw, hammer, nails, spraying machine, and wheelbarrow.

Since manual training has been added to the course of study, students frequently make pieces of apparatus which are useful in the laboratory. They are encouraged to construct such pieces of apparatus as can afterwards be used in their own teaching. As work in manual training becomes more general in the city and rural schools, correlation between this subject and agriculture can be made more profitable.

When the class is not too large and the amount of apparatus will permit, each student is assigned a set of tools. He is held responsible for their care during the season and at the close he puts them in order for the next year.

A part of the apparatus not mentioned above is the library of agricultural books. A bookcase in one corner of the laboratory contains the instructor's books, and these form the general library pertaining to the different phases of agriculture. Agricultural papers, magazines, and essays are on file. The North Dakota Farmer, published by a member of the faculty of the State Agricultural College, carries each month a department devoted to rural schools. Copies of this paper are frequently purchased in such numbers that each student is provided with one.

The following are some of the most helpful books at the disposal of the students:

Text-books and works of reference.

Name.	Author.
Elements of Agriculture	Shepperd and McDowell.
Elements of Agriculture	G. F. Warren.
Principles of Agriculture	L. H. Bailey.
First Book of Farming	Goodrich.
Agriculture for Beginners	Burkett, Stevens, and Hill.
First Principles of Agriculture	Goff and Mayne.
The Soil	F. H. King.
Agriculture through the Laboratory and School Garden	Jackson and Daugherty.
Cereals in America	T. F. Hunt.
Practical Agriculture	James.
Among Country Schools	Kern.
Rural School Agriculture	Davis.
Experiments with Plants	Osterhout.
Experiments in Agriculture for California Schools	Johnson.

Bulletins published by the United States Department of Agriculture, Washington, D. C.

FARMERS' BULLETINS.

No. 28. Weeds and How to Kill Them.
No. 35. Potato Culture.
No. 44. Commercial Fertilizers.
No. 51. Standard Varieties of Chickens.
No. 54. Some Common Birds.
No. 55. The Dairy Herd.
No. 57. Butter Making on the Farm.
No. 63. Care of Milk on the Farm.
No. 66. Meadows and Pastures.
No. 75. The Grain Smuts.
No. 95. Good Roads for the Farmer.
No. 99. Insect Enemies of Shade Trees.
No. 111. Farmers' Interest in Good Seed.
No. 126. Practical Suggestions for Farm Buildings.
No. 132. Insect Enemies of Growing Wheat.
No. 134. Tree Planting in Rural School Grounds.
No. 157. The Propagation of Plants.
No. 183. Meat on the Farm.

THE SCHOOL GARDEN.

No part of the work is more interesting and instructive than the school garden. It is impossible to give instruction in agriculture which shall be of real value where the garden is not the most important factor of the work. When the term "school garden" is used, as commonly understood in city and rural schools, is meant a place where vegetables and flowers are grown; in the normal-school use of the term it has a much more comprehensive meaning. It is first a place where such principles are demonstrated as can be taught later by the student as established knowledge. Through it the prospective teacher is acquiring knowledge which he can use in the instruction of others. The esthetic phase is here of secondary value. The vegetable garden has its place, but the grains, grasses, and legumes, their cultivation and relation to the soil, are factors of equal importance.

Four years ago the board of management placed 3 acres of land at the disposal of the department of biology, the necessary expense of working to be provided for by the State. The only restriction made was that all vegetables not used for experimental purposes were to be turned over to the boarding department. This restriction has a double value. It means a return for money expended and also teaches a lesson of economy. A set of books was opened in which an accurate account of the expenses and receipts was kept. The expenses included such items as preparation of the soil, purchase of tools, seeds, etc. The produce was sold to the boarding department at the regular city price. Notwithstanding the extra expense for the purchase of tools, the receipts of the first year were considerably more than the expenses. Subsequent years showed a decided balance on the credit side.

After the board of management had given its approval to the proposed garden, the following steps were taken toward developing the project: Early in March the students were made acquainted with the plans and began their preparations. First, a partial set of garden tools was ordered. Second, the exact dimensions of the ground were determined. Third, a map was drawn which indicated the location and extent of each plat and the purpose to which it was to be devoted. Fourth, the seeds were tested. Fifth, the soil was prepared. Sixth, the seeds were planted.

Each of these steps will be considered in the order named. It is quite evident that the preparation should commence several weeks before the actual planting is done. At first only those tools were obtained which were absolutely necessary to start the work. As the need for other tools developed they were obtained. When once the need of a particular implement was felt its use was readily learned. Although nearly every member of the class had been thoroughly drilled in arithmetic, most of them found it difficult to measure off a certain part of an acre or to put the dimension of the entire plat into acres or fractions thereof. Before this had been completed, a practical lesson in arithmetic had been taught. Two factors determined the amount of space that should be given to each vegetable planted, the use to which it could be turned by the boarding department, and its value to the class from the standpoint of instruction. One large plat 120 feet long and 24 feet wide was to be devoted to produce that could be used by the boarding department. After this, individual plats 12 feet long and 8 feet wide were indicated. Space was kept for walks 18 inches wide running north and south and east and west. The experiment plats were grouped together on the west side. Two large circular flower beds 16 feet in diameter separated the vegetable garden from the experiment part. Around the entire garden a narrow border of flowers was planned. Each student was required to make a map of the whole garden.

Seeds were obtained from three sources—the United States Department of Agriculture, the State Agricultural College, and a local dealer. Those obtained from the first two sources were contributed without cost. Thus the cost of seed was reduced to the minimum. Pie tins covered with thick blotting paper were used as seed testers. Twenty-five or 50 seeds, according to the size of the seeds, were selected at random and placed between sheets of blotting paper. Each tin bore a card with the date, name of the seed, and the name of the tester. The tins were placed in a part of the laboratory where the sun could fall upon them for a time each day. Students were required to moisten the paper from time to time and keep a record of the number of seeds that germinated each day. If the first test showed that the seeds possessed a low vitality, a second test was made. If the second test showed like results, the entire package of seeds was rejected. Results later showed that seeds which showed a high percentage of germination from these preliminary tests would nearly always germinate when planted out of doors.

The preparation of the soil needs but little explanation. Care was taken to leave the surface smooth and free from lumps. On the day previous to the planting the following directions were given: Each student was assigned his plat and the seeds which he was to plant. The depth at which different seeds were to be planted, the number of rows, the width between the rows, and their direction were carefully explained. No two persons were assigned the same kind of seeds. The purpose of this arrangement was to illustrate the different kinds of vegetables that may be grown in a school garden. After the seeds were sown a small board was set up near each plat, giving the name of the owner and the names of the seeds planted.

The care of these gardens was left entirely to the owners. The success of the garden plat is considered when the students' final standing is reckoned. The large plat previously mentioned is owned, planted, and cared for by the class as a whole. It is sometimes necessary to call for extra help in caring for this one.

The experimental garden is conducted upon a somewhat different plan. The plats are larger and are owned by the class as a whole.

The work extends over longer periods of time and requires a more scientific knowledge than the individual plats. Most of the work is done by the instructor and one or two students who have shown a special aptitude for this line of work. The class as a whole is always present, observing and making records, whenever any work is done upon these plats. Several plats are devoted to crop rotation, others to the demonstration of the value of certain fertilizers, the importance of good seed, spraying, and different methods of cultivation. To provide material for winter study two rows 50 feet long of each of the various grasses, legumes, cereals, flax, and hemp are planted.

For the past three years special experimental work has been done in the growing of potatoes. It has been demonstrated that the best potatoes are obtained when the seed has been selected with care the previous fall and two ''eyes'' are placed in each hill. Different varieties of potatoes are raised to ascertain which are best adapted to the local conditions; the best hills of all the different varieties are saved for seed. The following spring this seed is given to various persons in town who are interested in the raising of good varieties of potatoes. As a result many persons have discarded the mixed varieties and are raising one variety which has been found best to meet the local conditions. Up to the present time but little has been done with the small fruits. The work with strawberries, raspberries, and currants will be taken up this coming season.

The flower bed has its place in a school garden. As has been said, the entire garden is surrounded by a narrow hedge of flowers. This year sweet peas form the eastern border, nasturtiums the northern and southern, and sunflowers the western. Sunflowers were selected for the western border to screen a neglected lot. Individual flower beds and two large raised beds near the center of the garden help to break the monotony and add beauty. The flower beds on the lawn and campus are planted and cared for by the classes in agriculture.

The fall work in the garden consists of selecting seed, gathering such material as is needed for laboratory purposes, collecting data from experimental plats, removing rubbish, and packing away the tools for the following year. The part of this work which deserves special attention is the selecting of seed. For example, in the selecting of seed corn the size of the stalk, number and quality of the ears, and height of the ears from the ground are considered. Other seeds are selected with like care.

To carry on a normal-school garden successfully requires patience alike on the part of the instructor and of the students. Certain difficulties must be overcome. The regular school year closes the last of June and does not open until September or October. What shall be done with the garden during the summer months? The

Mayville School, as most other normal schools, has a summer session. In the past the class in agriculture during the summer session has been large. One summer 125 persons were registered in the different classes in agriculture. While many of these students were not in attendance when the garden was planted, or during its early stages, they were able to take up the work and gain much valuable information. The individual school gardens were assigned to them during the summer session. Thus the vacation problem was solved. The original owners, upon their return to school in September, found the garden in excellent condition. Another difficulty is in finding time to care for the garden. Experience has shown that it takes each person an hour and a half each week to care for his individual garden and keep in touch with the experimental part. The question arises, Shall this time be taken from the regular assigned hours or shall it be taken after school hours? We have been able to solve this difficulty by dividing the time between the two. Sometimes an entire Saturday morning can be devoted to the garden.

THE MODEL SCHOOL.

The problem of the model school is a comparatively easy one when the school is located upon the same campus with the normal school and is under the supervision of the normal-school faculty. Such conditions do not exist in the Mayville School. The two schools are separate and under different management. The work that would ordinarily be done with model-school children must be done with the normal-school students, either in the class in methods or in the school garden.

It is hoped that the time is not far distant when a model school can be located upon the campus and under the direction of the normal school. When this time comes, no doubt the head of the department of agriculture and nature study in the normal school will supervise the teaching along these lines in the model school. The closer the relation of the normal department to the corresponding work in the model school the more efficient will be the instruction in the model school. It is safe to say that few critic teachers in a model school are competent to teach and supervise all work with equal efficiency. Especially is this true in the work of agriculture and nature study. The normal-school instructor in these subjects should inspect every lesson plan and be present when the lesson is presented. Here he has an opportunity to note the efficiency of his own students, and to illustrate his methods by giving model lessons. In brief, no part of normal-school work should be more closely related to that of the model school than the work in agriculture.

VISITING A RURAL SCHOOL.

One or more trips to a rural school is a part of the work each year. Up to the present time but little has been done to make the surroundings of the country schools more attractive. The object of these trips is to encourage teachers to give more attention to this phase of rural schools. Previous to the first trip, the reasons why school grounds and buildings should be made more attractive and the way of making them such are considered. A careful study is made of a bulletin dealing with this subject and of O. J. Kern's work Among Country Schools. This preliminary study prepares the students to look for certain defects and to know how to study them. The first trip is largely one of inspection. The condition of the school buildings, outside and inside, location of outbuildings, condition of the grounds, and any other features which should be considered, are noted. Each student makes a sketch of what he sees and makes a note of any matter which he wishes to call up later. The next recitation period is devoted to a discussion of what was seen. Following the discussion each student makes a sketch of the school buildings, indicating where he would place walks, flower beds, vines, trees, and gardens. On the second trip the advisability of each one's plan is considered. The interior of the building is examined. The trip this year was made to a school whose teacher had been given instruction along these lines. The following conditions were found: Water pails on stools in an outer room, a pail for the waste, a mirror, towel and comb, several pictures upon the walls, curtains at the windows, and many more indications that the teacher was endeavoring to make the schoolroom attractive. Different students suggested the necessity of a larger bookcase, repainting of the woodwork, potted flowers, an inclosed stove, and a collection of the various grains and grasses grown in the neighborhood.

Such trips are usually made early in the morning, before the opening of school. This is done in order that the visiting class may have free access to the school building, and also that the teacher in charge of the school may have opportunity for some instruction along these lines. Frequently students contribute articles which can be used to make the schoolroom more attractive. Plans are now under way whereby one rural school not far distant from the normal school will be made a model in attractiveness. The fact that the same teacher has taught this school for the past three years, and is likely to continue, makes it possible to work out the plans in mind. The normal school is the center of frequent educational meetings, and the nearness of this school will make it possible to instruct a large number of rural teachers from the various parts of the State.

FIELD EXCURSIONS.

A class excursion generally carries with it the idea of a good time and little of real value. The reason is not hard to find. The teacher has not planned out his excursion sufficiently to know what he expects to do or to see. He depends upon circumstances, calling attention to this and that without anything definite in mind. The first requisite of a successful excursion is for the teacher to know the exact purpose of the trip. This means that he must know the situation beforehand. Second, each student must know what he is expected to do before he starts upon the trip. When each student is assigned a definite topic or piece of work he finds little time to waste. Upon these trips definite assignments are made, a sufficient time is given to work out the assignments, and the class is then assembled. The same order prevails that is maintained in the class room. Different students are called upon to report. The recitation proceeds from the general to the particular. After each has made his report a general discussion follows. Not long since a study was made of the nine different breeds of chickens which are kept at the school. Each person was requested to note the characteristics of a certain breed and compare these characteristics with those of another closely related breed. The average weight of the different kinds, the number of eggs laid within a certain time, the size of the egg, and the amount of feed required to keep each fowl were points that were considered in forming an estimate of the different breeds.

Not far from the school is a farm where the best breeds of domestic animals are kept. These are frequently studied in the manner indicated above. No excursion is complete until a full set of notes is taken and the class thoroughly questioned as to the things observed. The following day a hasty review is taken and possibly a few new points added. The keynote is to give each one something to do. The following outline illustrates the method of study applied to farm animals:

Dairy cattle examination card.

(1) General appearance.
  (*a*) Estimate the weight.
  (*b*) Stand in front of the animal and note the form.
  (*c*) Note the texture of the hair and elasticity of the skin.
  (*d*) Is the animal of a nervous or a sluggish disposition?
(2) Head.
  (*a*) Size of the mouth and nostrils.
  (*b*) Large, bright, and prominent eyes.
  (*c*) The long and narrow face, the straight or concave forehead.
  (*d*) The long and thin neck, but not scrawny,
  (*e*) The small horns and ears.

(3) Forequarters.
    (*a*) The thin shoulder.
    (*b*) Short legs and wide apart.
    (*c*) Rather low brisket.
(4) Body.
    (*a*) Broad loin, but not thickly fleshed as in beef cattle.
    (*b*) Straight back.
    (*c*) Large paunch carried rather low.
(5) Hindquarters.
    (*a*) Long, deep, and powerful.
    (*b*) Thin thighs.
    (*c*) High flank.
    (*d*) A long, slender, and loosely jointed tail.
(6) Milk capacity.
    (*a*) A broad udder, extending high up behind.
    (*b*) Not firm when empty.
    (*c*) Large and prominent milk veins.
    (*d*) Teats of medium size, well placed, and far apart.
(7) General information.
    (*a*) The age of the animal.
    (*b*) Number of quarts of milk produced each day.
    (*c*) Percentage of butter fat as determined by the Babcock test.
    (*d*) Care of dairy cattle.
    (*e*) Constituents of a balanced ration for dairy cattle.
    (*f*) The most marked characteristics that distinguish dairy cattle from beef cattle.

METHODS.

It is important that a course in methods of teaching agriculture shall be offered in a normal school. While it is true that a general course in methods will help to solve many problems in the teaching of agriculture, there are difficulties which are peculiar to the subject itself. The class in methods has been composed largely of high-school graduates, who have taken up agriculture from the high-school standpoint. It is assumed that the subject-matter is well in mind. How to teach the subject successfully is the important question. The study of agriculture is still in its infancy. Text-books and courses of study do not solve the problems. The teacher must use them as supplementary guides and his own individual methods as the final means of presentation.

A course of study in agriculture has not been found which presents a satisfactory sequence of ideas from season to season, grade to grade, and year to year. A large number of disconnected topics are suggested. The first work taken up in the agricultural methods class is the elimination, substitution, and arrangement of topics. Which shall be eliminated and which substituted is determined by the principles of interest and utility. Subject-matter must be taken up in such a way that the first lesson will lay the foundation for those which follow. The arrangement of a course in agriculture so that such a sequence shall exist is all important.

The second phase of the course in methods deals with the orderly way of doing things. The following topics are considered: The organization of the class, how to study material, how to create and maintain interest, laboratory work, field excursions, correlation, school gardens, school decorations, making simple apparatus, how to interest parents in school work, the child's preparation of the lesson, the teacher's attitude toward agriculture, and her preparation of the lesson. The above topics include the most difficult problems which the teacher will meet in teaching agriculture. Suggestions as to the method of solving these difficulties are highly pertinent.

The third and last part of the term's work is devoted to practice teaching by different members of the class. In preparation for this work, the instructor prepares a lesson plan, a copy of which is placed in the hands of each pupil, and presents a model lesson. The plan and presentation are then carefully discussed and the reasons for each step are made clear. The following four or five recitation periods are devoted to the consideration of lesson plans. Each student is required to prepare at least one such plan. One or two of these, as the time permits, are discussed in the class each day. Consultation periods are arranged so that the others may be taken up with the instructor. The course of study is such that it permits students to specialize in either primary, intermediate, grammar, or high-school work. The instructor ascertains the particular grade of work in which the student intends to teach and assigns him a certain topic which shall be presented to pupils of this particular grade. The other members of the class consider themselves, for the time, as pupils in this grade. After the lesson has been presented, criticisms are in order. It is somewhat difficult at first to induce students to criticize each other. After this difficulty has been overcome, the freest discussions take place. When the student-teacher understands that he must defend himself on every point, it results in very carefully worked-out plans which are presented with equal care. The method at first seems severe, but the results fully warrant the means used. Near the end of the term even the weakest members of the class are able to present lessons which rival those of the best students who did their teaching early in the term. For this reason the weakest students are always placed last on the list.

When a student has taken one year's work in subject-matter, supplemented by this course in methods, it is usually safe to recommend him for a high-school instructorship in agriculture.

CORRELATION.

The extent to which the work in agriculture has been correlated with other subjects has depended largely upon the instructors in charge of the other departments. Only two instructors have been members of the normal-school faculty continuously since the introduction of agriculture. At times a thorough and satisfactory correlation existed and at other times but little was attempted toward making the work in agriculture the basis of instruction in other subjects. A former instructor in geography, and a very successful man in this department, based his work in physical and commercial geography almost entirely upon their agricultural phases. Students who received instruction in his department later based their own teaching of this subject upon agriculture. A former pupil recently presented a model lesson which was considered one of the most interesting and instructive given at a teachers' institute. In brief, he considered the State as a large farm. The following topics, taken from a student's geography notebook, illustrate the scope of his plan:

> Erosion; soil formation; the atmosphere, and its effect upon animal and plant life; the effect of mountains and bodies of water upon the industries of the State; forests, and their effect upon rainfall; animal and plant life; the dominant industries of the State; how the soil and climate are adapted to these industries; the location of markets; and the cost of transportation.

Perhaps the best illustration of correlation between agriculture and other subjects has been found in the study of arithmetic. The instructor in this department believes that arithmetic should be made the most practical subject in the school curriculum. His classes are required to consult the managers of different near-by farms and obtain data pertaining to various farm problems. Problems of the city, such as taxes, electric lighting, waterworks, insurance, and municipal improvements are also worked out. He believes that when a student has worked out a problem the answer should state a fact worth knowing. Artificial problems are not considered. His pupils are frequently observed measuring tracts of land, or ascertaining the amount of lumber that is required to lay a sidewalk, build a house, or construct some other useful improvement. Such a method of teaching arithmetic is most practical, although of course it involves a large amount of work upon the part of the instructor; but it prevents his work from degenerating into a routine performance.

For example, this instructor secured the following data from an experimental patch of potatoes:

Row 1 produced 66 pounds.
2 produced 65 pounds.
3 produced 56 pounds.
4 produced 60 pounds.
5 produced 52 pounds.
6 produced 51 pounds.
7 produced 56 pounds.
8 produced 63 pounds.
9 produced 68 pounds.
Row 10 produced 52 pounds.
11 produced 51 pounds.
12 produced 50 pounds.
13 produced 37 pounds.
14 produced 35 pounds.
15 produced 33 pounds.
16 produced 37 pounds.
17 produced 32 pounds.

This data was used in the arithmetic class in teaching the subject of percentage. The major question was, "Which is the best method of planting potatoes, and what percentage better is it than any of the other methods?" The average of rows 1 to 7, inclusive, was taken as a standard and the average product of rows 8 and 9, 10 to 12, and 13 to 17 were compared with this average. The students were then asked to judge which method of planting seemed the best. Comparing the products of rows 13 to 17, where no terminal buds were planted, with the results from rows 8 and 9, where all terminal buds were planted, and also with the product of rows 3 to 7, where both terminal and lateral buds were planted, enabled the students to conclude that terminal buds produce the best crop.

In another instance data were obtained concerning a local farmers' elevator, and this information was then used in the study of stocks. There were 200 shares with a face value of $25 per share. The gross income for one year was $500, while the total expenses for the same year were $25. The net profit was given on only 180 shares, as stock to that amount only had been sold.

These examples suggest what can be done in correlating the work in arithmetic with that in agriculture. Problems similar to these are studied by the class in agriculture, and it has been found that such applications of arithmetic are of much help to the students in grasping the significance of agricultural problems.

The department of drawing depends to a considerable extent upon the department of science for class material. Plants, nature study, pictures, mounted specimens, sketches of the garden, landscapes, and domestic animals are frequently drawn.

In addition to the one term's work in zoology, which is devoted to animal husbandry, the economic phase of the various animals studied is always emphasized. Ten or twelve lessons are devoted to the study of insects and their relation to agriculture. The same method is pursued in the study of birds.

Physics, which is usually considered the most difficult and uninteresting subject in the normal-school curriculum, escapes many of its difficulties and becomes one of the most interesting when a practical application is given to the subjects studied. For two years, in addition to the regular text-book, a supplementary book, Physics of Agriculture, was used. The following are a few of the many topics studied: Evaporation, mulches, capillarity and porosity of soils, films and the gravity of water, texture of soils, solar energy, latent heat, ventilation of soils and buildings, drainage, various motor powers, pumps, friction in machinery and how to overcome it. Pieces of apparatus were constructed which could be used later by members of the class in their own schools.

In every case correlation has been successful, when the instructor was sufficiently versed in his own subject and the kindred subjects to know when and how to bring the two together to the best advantage. Experience has shown that attempting to correlate them without this knowledge is likely to prove disastrous to both subjects. It should not be attempted until the relations have been thoroughly worked out by the instructors concerned. Students who have taken a thorough course in elementary agriculture are keen critics of any inaccuracies of one who attempts to correlate his own subject with that of agriculture. Furthermore, correlation in a normal school must be such that the student is able to see the relationships in such a way that he can apply the same principles, modified by local conditions, in his own school.

DIFFICULTIES.

It must not be understood from the content of this circular that instruction in agriculture in a normal school does not present difficulties. Probably no subject in the curriculum presents more difficulties and yet offers larger opportunities than this one. The first difficulty that presents itself to the instructor has been the lack of authoritative literature. The subject has been treated almost entirely from the agricultural-college or high-school standpoint. The normal-school interest has been neglected. To attempt to follow suggestions which are intended for another and higher phase of the subject means that the student will come short of full success in the elementary schools. Agriculture is made up largely of problems. The student in the normal school meets these problems as normal-school problems. Later as a teacher he meets these same difficulties from an entirely different standpoint. The step from the student's standpoint to that of the teacher is often a long one. How to connect these two points of view is not an easy problem. A greater amount of teaching in the model school seems to be the best solution thus far discovered. Here the subject should be looked upon from the elementary-school standpoint, and not from that of the normal school

The next difficulty is the lack of cooperation which frequently exists among the members of a normal-school faculty. The tendency seems to be for each instructor to consider his own department the most important. The introduction of a new subject is looked upon as an innovation. It must pass through a probation period, and the position which the subject will have later depends largely upon the genius of the instructor. If, during this experimental stage, the instructor is able to show results which compare well with those of the other departments, he will soon be able to place his subject upon an equality with those of longer standing. The closer the cooperation between departments and the more correlation of subject-matter, the more efficient will be the work of all departments.

The last difficulty which requires mention is the lack of preparation of many who attempt to teach agriculture in the elementary schools. Students will frequently enter the normal school for the winter term and take up one term's work in agriculture. At the end of three months they will attempt to teach this subject, of which they know comparatively little. Their failure is so marked that parents are likely to consider the whole movement for agricultural instruction a failure. They look upon it as another "fad," and believe that school time can be more profitably spent in the study of the three R's. Under no circumstances should a teacher attempt to teach agriculture before he is thoroughly prepared. Boys and girls who have always lived on the farm are too familiar with the general facts of agriculture to accept anything which is not well established or does not enlarge upon what they already know. In this failure to make the instruction in agriculture what it should be, the normal school suffers most under present conditions.

CONCLUSION.

In any scheme of readjusting the public-school system so that the work of the schools shall have a more direct relation to the work of life, the normal school must be considered. It is perhaps too much to expect that the normal schools shall take the lead in this readjustment; they must work in cooperation with the schools. When the public schools demand that certain subjects shall be taught, the normal school must readjust its work to meet this demand. In this sense the problem of the public school is the problem of the normal school. The heads of the various departments in the normal school must be persons who are familiar with common-school difficulties. Actual experience counts for more than theory. In the movement to introduce agriculture into the school system the normal school is one of the important factors. It should not only prepare young people to teach the subject, but through its publications, instructors, and the press it should educate the masses along these lines. In short, the normal school should be a vital educational force in the community and State at large. If the normal schools generally shall fail to give adequate instruction along the industrial and vocational lines now demanded by the persistent sentiment of the people, they must be content to see this line of teaching preparation pass to other agencies not originally intended for normal work. When the normal schools demonstrate clearly that they are sending out persons who are prepared to teach subjects which deal with conditions at home, upon the farm, and in the community, school boards will be willing to pay better salaries to teachers than they are paying at the present time. Better compensation means stronger competition, which results in a higher grade of teachers.

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